

## Approach Road Inspection and Rating



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Class B Bridge Inspection Course



## Introduction

- Approach road is the road leading up to the bridge structure
- For culverts it includes the road fill over the culvert
- Considers
  - Geometric alignment at the bridge site
  - Condition of approach fill
  - Inventory and condition of guardrail on approaches
  - Drainage on approaches to bridge



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## Approach Road Section - Bridges

Approach Road			
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			
Approach Bump			
Guardrail (Y/N)			
Guardrail			
Length (m)			
Current Standard (Y/N)			
Termination Type			
Drainage			
<b>Approach Road General Rating</b>			



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## Road Use

- Roads are used by:
  - Old people who may have reduced abilities
  - Teenagers who just got licenses
  - Immigrants who are still inexperienced
  - Inattentive drivers
  - Impaired drivers
  - Drivers who speed
  - Bad drivers
  - Drivers who are unfamiliar with the area
  - Autos that have bald tires
- Right or wrong, alignment handles them all. Coupled with abuse, success is not always guaranteed.



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## Approach Road Section - Culverts

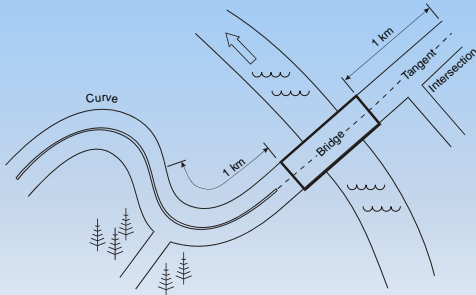
Approach Road / Embankment			
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			
Embankment			
Sideslope (L:1)			
(Height of Cover (m) : )			
Guardrail (Y/N)			
<b>Approach Road / Embankment General Rating</b>			

## Alignment

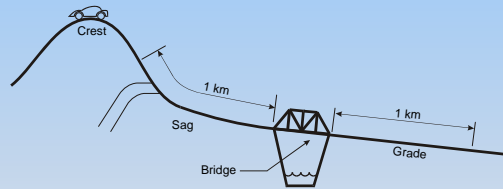
Approach Road / Embankment			
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			

- Separate rating to be provided for horizontal and vertical alignments
- Defects in alignment must be categorized in either the horizontal or vertical components
- Inspector should consider road alignments are used during adverse weather or road conditions – e.g. fog, heavy rain, snow, ungravelled surfaces, icy roads

## Length of Approach



## Length of Approach



## Alignment

- Design speed is the posted legal speed for road plus 10 kph
- Evaluate by driving at the legal speed limit - if safe to do so and if conditions permit.
- Observe sight distances
- Note if bridge is superelevated
- Note presence of speed limit or other signs
  - Sharp curve
  - Bus stop ahead
    - indicates sight distance problem
  - Intersection ahead
    - indicates sight distance problem

## Horizontal Alignment Defects

- Horizontal defects result in a reduction in speed to drive the road safely. They include:
  - Reduced visibility – trees, buildings, embankments
  - Sharp corners
  - Intersecting roads
  - Bridge is at beginning of curve
  - Bridge is offset from straight alignment
  - Note if passing can still be done safely

## Horizontal Alignment Ratings

- Note presence of intersecting roads and record location on form (Field accesses do not affect rating).
  - Rate 7 or less depending on visibility, traffic volume and traffic type.
  - Rate may be 8 or 9 if no intersections for 1km
- If horizontal defect is cause of reduced speed, then rate:
  - 6 or more if driven safely at legal speed limit
  - 5 if can be driven safely and posted not more than 20 km/hr below legal speed limit
  - 4 or less if posted more than 20 km/hr below the legal speed limit
  - 4 or less if sharp or blind curves
  - 5 if Land Access bridge and appropriate warning signs are in place.

## Vertical Alignment Defects

- Vertical alignment defects result in a reduction in speed to drive the road safely. They include:
  - Reduced visibility – crests in road
  - Steep grades (take into consideration road surface e.g. loose gravel)
  - Adequate sight distance for stopping or passing
  - Intersecting roads

## Vertical Alignment Rating

- Vertical alignment with a straight grade of 1% or less - rate 9
- If road can be driven safely at legal speed limit rate 6 or more
- If road can be safely driven and posted not more than 20 km/hr below legal rate 5
- Rate 4 or less if:
  - posted more than 20 km/hr below posted speed
  - sight distance is less than required
  - Steep grades, blind crest curves
- Rate 2 if combined effect of horizontal and vertical alignment is hazardous (e.g. very steep hill combined with sharp hair-pin curve)
- Rate 5 if Land Access bridge

## Alignment

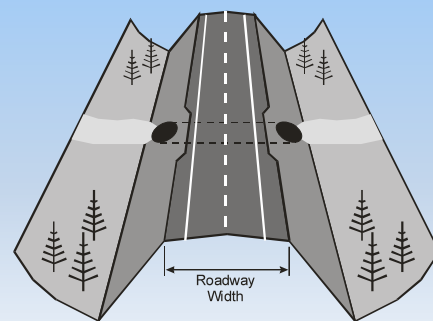
- For land access structures:
  - Road services land only, not residential access
  - Local road standards do not apply
  - Consider suitability for traffic
- If adequate for intended use and appropriate warning signs are in place, the Horizontal and Vertical alignment ratings can be rated 5

## Roadway Width

Approach Road / Embankment			
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			

- This is the width of the traveled lanes and shoulders
- Do not include median width if present
- If curbs on the approach road, measure between faces
- Measure at a representative cross-section
- Record to the nearest 0.1m
- Provide explanation if different on each side of structure

## Roadway Width



## Approach Bump

Approach Road			
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			
Approach Bump			

- Bridges only
- Refers to the smoothness of the transition onto the structure
- Severe bump
  - Can be hazard to traffic
  - Increases impact on structure

## Approach Bump

- May be a symptom of
  - Settlement of the approach fill
  - Instability of the fill (slumping)
  - Undermining of fill by water
  - Settlement of or damage to approach slab
- Drive over at legal speed if safe – or at safest speed that conditions allow
- Observe traffic crossing structure
- If no defects and smooth transition rate 9
- If bump is noticeable but tolerable - rate 5
- If speed must be reduced - rate 4 or less
- If hazardous to traffic - rate 2 or less

## Guardrail

Approach Road			
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			
Approach Bump			
Guardrail (Y/N)			
Guardrail			
Length (m)			
Current Standard (Y/N)			
Termination Type			

- Refers to the guardrail or other traffic barrier along the edges of the approach road
- Purpose:
  - Prevent traffic from leaving the roadway at the structure
  - Prevent traffic from impacting structure

## Guardrail - Culverts

- Rating is not required
- Record the presence of guardrail by **Yes** or **No**
- Provide comment if guardrail is on one shoulder only
- Guardrail that is too short or is otherwise ineffective – provide comment and maintenance recommendation
- Provide comment and maintenance recommendation if missing and is required for safety
- Note defects (e.g. - broken posts, damaged rails) and provide comment and maintenance recommendation

## Guardrails - Bridges

- Record the presence of guardrail by **Yes** or **No**
- Record the minimum length to the nearest meter
  - Explain if different lengths exist
- Maximum is 99 m
- Record the type of termination
  - Common type is Turned Down, wing, Attenuator
- Based on current Standard Drawings record if the guardrail meets current standards (Yes/No)
  - Explain if No
  - Acceptable explanation is “Not thriebeam”
- Link to current Standard Drawings:
- <http://www.transportation.alberta.ca/4855.htm>

## Guardrails - Bridges

- Inspect up to 45m from bridge
- Inspect all components of guardrail
  - Posts
  - Rail
  - Connections
  - Splices
  - Termination
- Rate according to condition only - not standard
- Minor damage but still functional – rate 5
- Missing bolts or improper laps - 4 or less
- Damaged - requires replacement – rate 3 or less
- Damaged – potential hazard – rate 2 or less
- Rate “X” if no guardrail exists
  - If required, recommend action and explain



### Approach Road - Evaluation and Rating



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### Approach Road - Evaluation and Rating

## Drainage

- Applies to bridges only
- Refers to the ability of the approaches to handle drainage
  - Must not allow water to drain onto structure
  - Must not allow damage to fills or headslopes
  - Must not pond on approaches
- Includes drain troughs on approaches
- Water may originate from
  - Precipitation onto approaches
  - Runoff from roadway
  - Runoff from structure



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## Drainage

- Look for:
  - Ponding of water on approaches or ends of structure
  - Erosion of fills, sideslope or ditches
  - Voids under approach slabs or abutments
  - Undermining of drain troughs
  - Damage or deterioration of drain troughs

## Drainage

- Good drainage away from bridge – rate 5 or more
- Drainage onto bridge gutters - rate 4 or less
- Drainage onto bridge driving lanes - rate 3 or less
- Drainage eroding headslope or sideslope – rate 4 or less
- Erosion from approach road ditch drainage – rate 4 or less
- Drainage causing a hazard - rate 2 or less (e.g. ponding or icing into travel lanes)



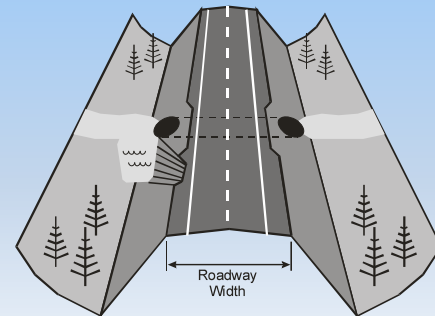


## Embankment

Approach Road / Embankment			
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			
Embankment			
Sideslope (.:1)			

- Applies to culverts only
- Rates the stability of the road embankment at the culvert and the effects on:
  - traffic
  - structural and functional integrity of the culvert
- Evaluates:
  - roadway surface
  - sideslopes
  - transitions at ends of culvert

## Embankment



## Embankment

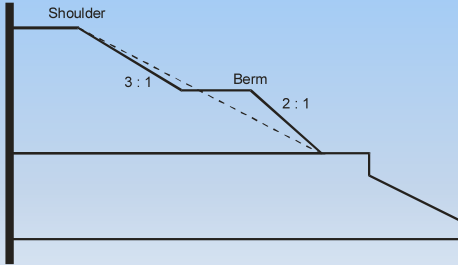
Refers to Culvert Approach Roads

- Look for:
  - cracks or other evidence of instability
  - signs of erosion such as gullying on sideslopes
  - scour at toes of sideslopes or end transitions
- Embankments with no instability or scour/erosion - rate 9
- Embankments with erosion problems - rate 4 or less
- Unstable embankments causing damage to the culvert - rate 3 or less
- Unstable embankments affecting roadway - rate 3 or less

## Sideslopes

- Estimate or measure the slope of the sideslope (h:v)
- Record steeper of upstream or downstream sideslope
- If berms or different slopes on the same side, record steepest slope
  - Do not record average slope
- Explain if sideslopes are irregular
  - varying slopes
  - benches or berms
  - different slopes on each sideslope

## Sideslopes

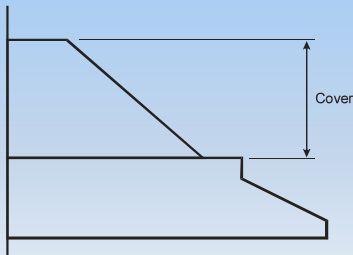


## Height of Cover

	Approach Road / Embankment		Explanation of Condition
	Last	Now	
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			
Embankment			
Sideslope ( : 1)			
(Height of Cover) (m) : )			
Guardrail (Y/N)			
<b>Approach Road / Embankment General Rating</b>			

- The vertical distance between the centreline roadway surface and the crown of the culvert
- If different - measure at both ends and record average
- Need to be accurate for low covers
  - Live load effects are greater
- Record to the nearest 0.1m

## Height of Cover



## General Rating

Refer to 1.10. 1 and 6.8 (Bridges)  
Refer to 1.10.6 and 13.4.6 (Culverts)

- Governing Elements
  - Horizontal alignment
  - Vertical alignment
  - Safety Concerns (severe approach bump)
  - Potential hazards (Drainage causing ponding/icing)
  - Embankment rating of 3 or less (Culverts)
  - Guardrail that is damaged resulting in a hazard (i.e.
- Missing approach rails that create a hazardous situation may govern the Gen. Rating (rate 2)

Questions??



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